IOWA STATE UNIVERSITY
SCIENCE
BOUND

Nothing Less Than Success

SCIENCE AND TECHNOLOGY FAIR

I. General Overview, Project Rules and Guidelines

Science Fair projects should be original. NO TEAM PROJECTS or DEMONSTRATIONS, MODELS OR KITS are allowed.

Your science fair project must demonstrate use of the scientific method.

The student researcher is responsible for all aspects of the research project, such as enlisting needed adult supervision, obtaining necessary approvals, following the rules and guidelines, and doing the experimentation, data analysis, etc., involved in doing the project.

The SCIENCE BOUND teacher is ultimately responsible for the health and safety of the student doing the research, and the humans or animals used as subjects. The teacher is responsible for ensuring that the student's research is eligible for entry into the fair. Before experimentation begins, the SB teacher must review and approve all projects involving human subjects, vertebrate animals, potentially hazardous biological agents and hazardous chemicals, activities or devices.

Projects that are demonstrations, library research or informational projects, explanation models or kit building are **not appropriate** for the fair.

All science fair projects should be conducted using the **scientific method,** which is a process of experimentation used to explore observations and answer questions. It can be used to discover cause and effect relationships—to learn what happens to something else when just one thing changes. The scientific method includes

- a question
- an hypothesis
- the experiment design
- conducting the experiment
- analyzing the data
- drawing conclusions
- evaluation of the outcomes of the experiment

<u>There should be no team presentations.</u>

II. How to Produce a Successful Project

1. <u>Pick your Topic</u>

   Get an idea of what you want to study. Ideas might come from hobbies or problems you see that need solutions. Study a topic that interests you. If you are bored with the

topic, you will not enjoy the experience. **Demonstrations, models, or kits are NOT a project.**

You can find topic ideas and help at the following websites:

- *Discovery Channel School: Science Fair Central*
  http://www.discoveryeducation.com/search/page/6-8/-/-/science%20fair/index.cfm?campaign=deHeader_search This site provides a complete guide to science fair projects, and project ideas.
- *Science Buddies*
  http://www.sciencebuddies.org
  This site provides a topic selection wizard, and helps you through the process of a science fair project.
- *Science Bob*
  http://www.sciencebob.com/lab/sciencefair/ideas.html
  This site has many good project ideas.
- *The Ultimate Science Fair Resource*
  http://www.scifair.org/
  This site has a variety of ideas and advice.

2. Develop a Research Question
   Research generally begins with a question or problem. Usually the problem is too broad to address in a single study. For example you may be interested in the behavior of your dog. You would need to narrow the topic down to one behavior or idea, such as if color affects eating patterns. Your teacher can help you narrow down your topic.

3. Research your Topic
   - Go to the library and online to read everything you can on your topic.
   - Observe related events
   - Gather existing information on your topic
   - Look for unexplained or unexpected results
   - Talk to professionals in the field
   - Write companies for specific information
   - Obtain or construct needed equipment
   - Note: Websites can be a great source of information, however not all websites have accurate information. Be critical of each website you use, looking for who produced the site, and where their information came from. Books and journals are scrutinized for accuracy before published; websites are not always verified.

4. Develop a Hypothesis
   A hypothesis is a specific statement of prediction. It describes what you think will happen during the experiment or study. Not all studies will have hypotheses. Some engineering studies have engineering goals instead. An engineering goal would include how you think the project will work or what will be the engineering outcome.

5. Develop a Purpose
   The purpose explores the ideas behind the research. Why is the research to be done? There should be a reason for wanting to do the research. Some explanation should be given as to what the research is expected to show and what is to be learned. This will be included in your abstract later.

6. Create a Timetable
   A timetable is a set of deadlines to meet as you work on your project to keep you on track. A science fair project cannot be completed in a few days or the night before. **Work with your SCIENCE BOUND teacher from the beginning of your project to get supplies BEFORE Christmas break.**

7. Write your Procedure
   Once you have a project idea, write your procedure. This plan should consist of step-by-step instructions. It should not be written in paragraph form. The main goal of the procedure should be that anyone else reading the research would be able to copy it exactly. Your procedure should include precise measurements and amounts. Your experiment should also be a controlled experiment where all factors that could change the outcome of your experiment are regulated; leaving uncontrolled only the one thing (variable) to be tested. Your SB teacher can assist you in writing the procedure.

8. Work With your SB Teacher to Review your Project
   Projects must adhere to local, state, and U.S. Federal laws and regulations. All projects must also adhere to the following ethics statement:
   - *Scientific fraud and misconduct are not condoned at any level of research or competition. Plagiarism (use or presentation of other researcher's work as one's own) and fabrication or falsification of data will not be tolerated. Fraudulent projects will fail to qualify for competition.*
   -

   Introduction or disposal of foreign or non-native substances or species, toxic chemicals or pathogenic substances into the environment is prohibited. It is the student's responsibility to check with the SB teacher if they have any questions or concerns regarding these rules, restrictions and guidelines as they relate to their project.

9. Conduct your Experiment

   Give careful thought to experimental design. During your experiment, keep detailed notes in your journal. Make sure you write down each measurement and observation. Do not rely on your memory. Remember to change only one variable at a time when experimenting. Make sure you include sufficient numbers of test subjects in your experiment. For example, growing one plant to test the effects of music is not enough, a group must have 5 or more subjects to be valid.

10. Examine your Results

    When you complete your experiment, examine and organize your findings. Did your experiment give you the expected results? Why or what not? Was your experiment performed with the exact same steps each time? Are there other explanations that you had not considered or observed? Were there errors in your observations? Remember that understanding errors and reporting that a variable did not change the results can be valuable information too.

11. Use your Project Log Book

    Your log book is your most important piece of work. Accurate and detailed notes make a logical and winning project. Good notes show consistency and thoroughness to the judges.

    Your log book should be set up with the following information:

    1. Title Page: Write the title of your project in the form of a question.
    2. Table of Contents
        a. Abstract: This is a one page summary of your project. It should not be more than 250 words. It should include what the project is about, how you came up with the project, and what you learned during the project. Write if your hypothesis was supported or not supported. (This will also need to be copied to a form displayed at your project during the fair.)
        b. Purpose: Express why you choose this project. “Because I had to” is not an acceptable purpose.
        c. Hypothesis: Write you hypothesis statement.
        d. Procedure: This should be your step-by-step instructions to complete your experiment. Each step should be numbered; it should not be written in paragraph form.
        e. Results/Data: Tell what happened during your experiment. This is where you record your findings, measurements, graphs, charts, photos, etc.

f. Conclusion: This should summarize your project from the data and the data should be related to your hypothesis. You will answer the question of whether the hypothesis was supported by the results or not. If you experienced errors or difficulties during your experiment, write about them here. Express whether you would do anything differently next time and what the next steps are for future research on this subject.
g. Bibliography: This must be written in alphabetical order. This is a list of all the resources you used during your experiment. (If you interviewed anyone for you project, in the bibliography list the person's name, the person's occupation or relationship to you, the date of the interview, and the place you met with them.)
h. Acknowledgements: List the people you wish to thank for helping you with your project. Make sure you spell their names correctly.

12. Prepare your display

Design the display so that others may benefit from looking over the research in a visual display. You will want it to be attractive and easy to read. Make headings stand out. Draw graphs and diagrams and label them correctly. Project display boards will be provided.

Electricity may be requested. If you plan to use electricity, please keep in mind the following (work with your SB teacher if you have questions):

- Presenters must provide a UL-listed 3-wire extension cord which is appropriate for the load and equipment.
- All electrical connectors, wiring, switches, extension cords, fuses, etc. must be UL-listed and must be appropriate for the load and equipment.
- There must be an accessible, clearly visible on/off switch or other means of disconnecting from the 120 or 220 volt power source.
- Any lighting that generates considerable or excessive amounts of heat (high intensity lamps, certain halogen lights, etc.) must be turned off when the student is not present.

Helpful hints for your display

1. Your display should have a descriptive title; it should be an attention-grabber and tell what your project is about.
2. Take photographs of your experiment to help others understand your process. Photographs and/or visual depictions are allowed in a display if:
   - They are not deemed inappropriate by the SB teacher.
   - Credit lines of their origins (Photograph taken by…"or "Image taken from…") are attached. If all photographs displayed were taken by the

student or are from the same source, one credit line prominently displayed is sufficient.

- They are from the Internet, magazines, newspapers, journals, etc., and credit lines are attached.
- They are photographs or visual depictions of the student.

All photographs must have a credit line, even if the student took all of the photographs. Make sure the credit line can be read on the display board.

- Credit Guideline: Use 12 point font (Arial or Times New Roman) on address labels and attach to the photographs/images.
- Please be sure to include the photographer, the source (i.e. Des Moines Register) if applicable, and the date the photo was taken or printed.
- NOTE: these visual rules for photographs apply to any visual depictions or presentations in the display area (including on laptop/computer presentations slide presentations, etc.)

3. Be organized.
4. Don't hesitate to ask for advice from adults if you need it.
5. Material should be typed.
6. Be safe. **Check with your SCIENCE BOUND teacher** about having any of the following at the competition:
    a. Living organisms, including plants
    b. Taxidermy specimens or parts
    c. Preserved vertebrate or invertebrate animals
    d. Human or animal food
    e. Human/animal parts (blood, urine)
    f. Plant materials (living, dead, or preserved) which are in their raw, unprocessed, or non-manufactured state.
    g. All chemicals, including water (Exceptions: water integral to an enclosed apparatus or water supplied by the display and safety committee at the state competition)
    h. All hazardous substances or devices
    i. Sharp items
    j. Dry ice or other sublimating solids
    k. Flames or highly flammable materials
    l. Batteries with open-top cells
    m. Active internet or email connections as part of displaying or operating the project
    n. Glass or glass objects unless deemed by the display and safety committee to be an integral and necessary part of the project
    o. Any apparatus deemed unsafe by the SB teacher

13. Judging

Prior to the science fair, your Science Bound teacher will provide an assessment of your effort and attitude during the science fair project development process. This score may be included in your final project assessment

At the fair, judges will evaluate how well you followed the scientific method, the detail and accuracy of your research, and if procedures were clearly defined and used in the best possible way.

Judges highly regard students who can speak confidently about their work. They are not interested in memorized speeches; they want to talk with you about your research to see if you have a strong grasp of your project from start to finish. Judges may ask you questions about your project. See the judging form to see how your project will be scored.

Please be respectful of other students' projects – any student or person caught tampering with or being destructive to another project will immediately be removed from the fair, disqualified from the competition; and subject to release from SB.

SCIENCE AND TECHNOLOGY FAIR
SCIENCE BOUND
JUDGING FORM
Project Name_____
Project Number_____

Relevance and Articulation of Research Problem/Project: Well defined, original, problem is of significance, focused and clear	**Excellent 5**	**Good 4**	**Average 3**	**Fair 2**	**Poor 1**
	Comments:				
Scientific Method and Thought: Clear hypothesis and high quality plan for scientific investigation, accurate observations and data analysis, valid identification and interpretation of conclusions, a well reasoned argument	**Excellent 5**	**Good 4**	**Average 3**	**Fair 2**	**Poor 1**
	Comments:				
Thoroughness: Project carried out with careful and appropriate investigative procedures and methods, well documented investigation	**Excellent 5**	**Good 4**	**Average 3**	**Fair 2**	**Poor 1**
	Comments:				
Implications: Articulates potential impact of research; considers who might benefit from findings of research; has thought about future related research	**Excellent 5**	**Good 4**	**Average 3**	**Fair 2**	**Poor 1**
	Comments:				
Display: Exhibit is well constructed, visual presentation is carefully prepared and effective	**Excellent 5**	**Good 4**	**Average 3**	**Fair 2**	**Poor 1**
	Comments:				
Oral Presentation: Effective and concise, student is able to engage in meaningful discussion and answer questions about project, clearly understands project	**Excellent 5**	**Good 4**	**Average 3**	**Fair 2**	**Poor 1**
	Comments:				

YOU MUST RECEIVE AT LEAST 20 POINTS TO PASS!

IV. Checklist

___ I've chosen a topic.

___ I've checked my topic with my SCIENCE BOUND teacher.

___ I've researched my topic.

My hypothesis (what I think will happen or how I think this will work) is:
_____

_____

_____

The purpose for my research (why the research is being done) is: _____

_____

_____

___ I am respectfully listening to, and following, the advice of my Science Bound teachers during this process.

My timeline is:

Date	**Action**
	review experiment with SCIENCE BOUND teacher
	assemble materials
	begin experiment
	complete experiment
	examine the results
	write up the results
	plan display
	assemble display components (including printed materials, photos and labels)
	practice presentation mentally to ensure display will be complete
	assemble display

	practice presentation

Procedure (step by step instructions for experiment):

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

V. Judging

Judges look for a firm handshake and eye contact. Be prepared to respond to the following:

1. Tell me about your project.
2. How/why did you study this?
3. Does your data support your hypothesis? (Did your invention work as you intended?)
4. In what ways did you follow the scientific method?
5. If you were giving advice to someone else repeating this experiment/project, what would you tell them to do differently, based on how yours turned out?
6. What might you study next related to this experiment?